I. INTRODUCTION

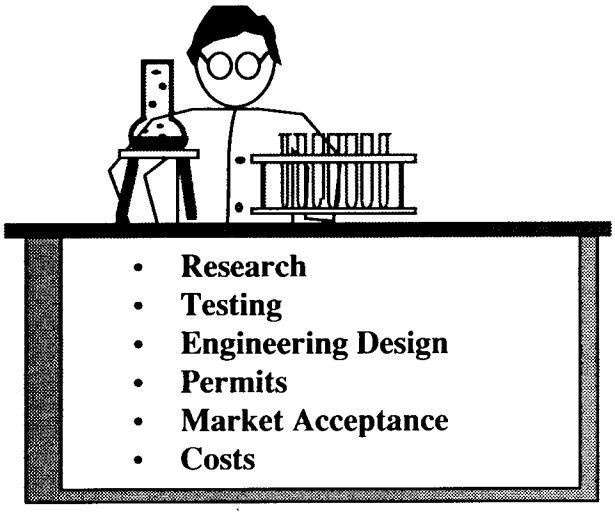
As required by the Superfund Amendments and Reauthorization Act (SARA), EPA's Office of Solid Waste and Emergency Response (OSWER) is placing greater emphasis on permanent remedies at hazardous waste sites, where such action is appropriate. OSWER's Technology Innovation Office (TIO) has a broader mandate to also increase the application of innovative technologies at Resource Conservation and Recovery Act (RCRA) corrective action sites and in the remediation of underground storage tanks. An important component of such efforts is the development of less costly and more effective innovative treatment technologies.

In investigating the needs of technology developers in the development, demonstration, and commercialization of their technologies, TIO found that much of the available information was not assembled in a single conveniently available format. TIO also found that there is potential demand for a variety of programs, facilities, and services. Table 1 on the previous page lists the types of services available to developers.

For the purposes of this booklet, available programs, facilities, and services have been divided into three categories:

- Assistance programs
- Technology incubators and test and evaluation (T&E) facilities
- University-affiliated hazardous waste research centers.

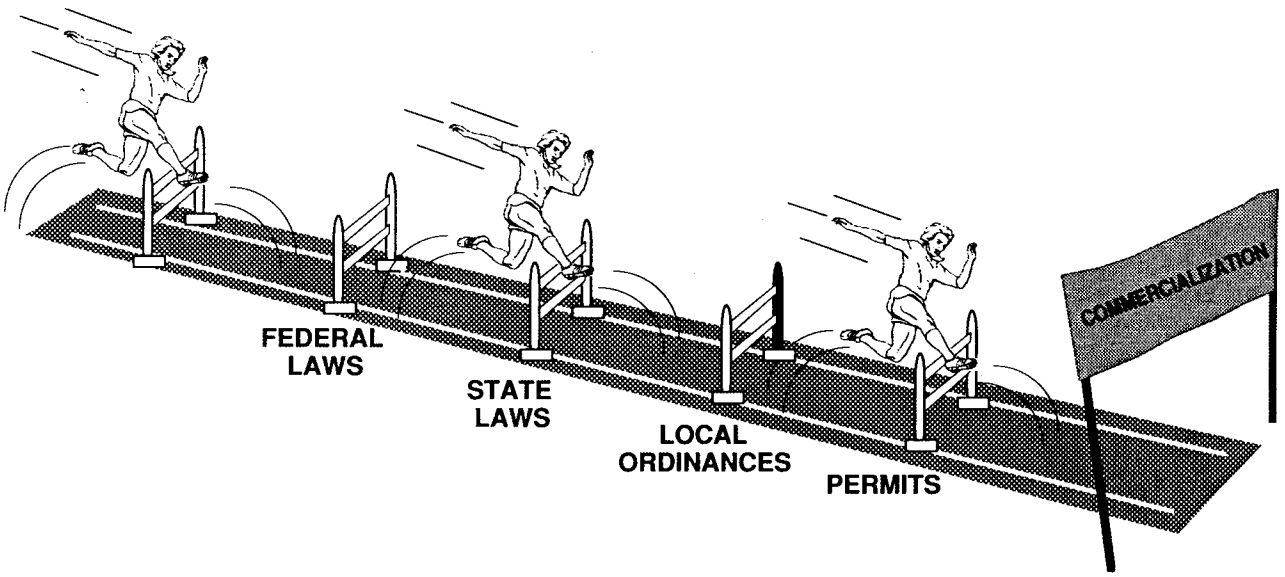
Developers are Confronted With an Array of Challenges



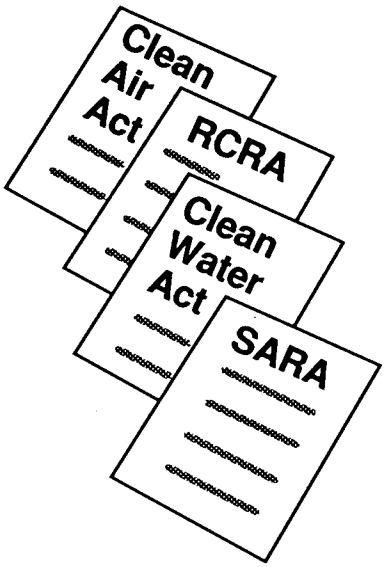
This booklet begins with a brief overview of the regulatory requirements. The remainder of the document summarizes assistance programs, facilities, and research center services available to developers of innovative hazardous waste treatment technologies.

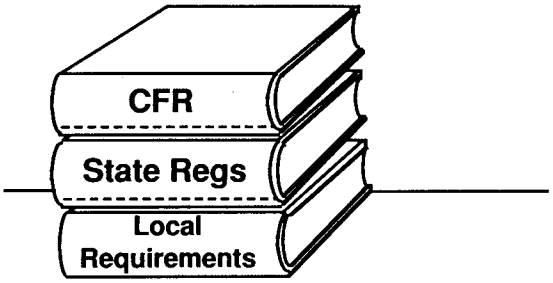
Information contained in this booklet was gathered primarily from facility personnel. The descriptions provide a snapshot of the equipment and expertise available. The list of assistance programs and test and evaluation facilities is comprehensive. The university-affiliated research centers are meant only to be illustrative of potential sources of assistance. Developers should use this booklet as a point of departure for contacting programs, facilities, and services.

Developers Face Regulatory Hurdles



II. REGULATORY REQUIREMENTS





The field of hazardous waste remediation is relatively unique in the extent to which research and development, as well as full-scale technology application, may be subject to regulation. Acquiring permits not only necessitates gathering substantial amounts of information, but also may require a significant lead time before they are actually issued. These factors must be considered in developers' planning processes.

An awareness of regulatory requirements can assist technology developers in avoiding regulatory problems, determining market "niches," and accelerating market acceptance.

Since Federal and State regulatory programs are dynamic, and because requirements differ among States, it is not possible to provide definitive guidance in this booklet. Interested parties should contact appropriate Regional or State regulatory personnel for up-to-date information on regulatory requirements. The following sections on technology development and technology application provide some general regulatory information useful to developers, particularly those just entering the environmental field who may not be fully aware of regulatory requirements.

TECHNOLOGY DEVELOPMENT

Permitting

EPA has issued a number of regulatory provisions intended to provide relief in permitting and testing requirements for technology developers. Since States vary in the extent to which they have adopted these provisions, developers should contact their EPA Region or State to verify their applicability in a particular jurisdiction.

Research, Development, and Demonstration (RD&D) permits (40 CFR 264, 270) are available to technology developers who wish to conduct limited duration and limited quantity testing on actual hazardous waste. The intent of this provision is to set up a permitting process for RD&D activities that is less expensive and time-consuming than full-fledged Resource Conservation and Recovery Act (RCRA) permitting.

EPA has also issued the 1000kg Treatability Exclusion (40 CFR 261), which may exempt small-scale testing activities from permitting requirements. Developers wishing to use the 1000kg treatability exclusion should obtain a copy of the regulation to ensure compliance with its provisions and verify that it is applicable in their State.

Table 2 contains a list of EPA Regional contacts to consult in determining the applicability of RD&D permitting and the 1000kg treatability exclusion. In addition to the Regional contacts, personnel at a number of the facilities described in this booklet may be able to provide assistance in understanding regulatory requirements.

TABLE 2
EPA REGIONAL CONTACTS
(See Figure 1 for map of Regional offices)

Region I	John Podgurski (617) 573-9673
Region II	Andrew Bellina (212) 264-0504
Region III	John Humphries (MD, VA, WV, DE) (215) 597-1812 Paul Gotthold (PA, D.C.) (215) 597-7370
Region IV	Douglas McCurry (404) 347-3433
Region V	Karl Bremmer (312) 353-4783
Region VI	James Sales (214) 655-6785
Region VII	Lydell Harrington (913) 551-7657
Region VIII	Tom Burns (303) 293-1798
Region IX	James Breitlow (415) 744-2064
Region X	Mike Gearheard (206) 553-2782

Performance Standards

Developers need to know the performance standards potentially applicable to their technology. Performance requirements for hazardous waste cleanup may involve cleanup goals based on site-specific factors or the application of pre-established technology-based standards. Standards to which a technology *may* be subject can be found in EPA's Land Disposal Restriction guidelines (40 CFR 268) for contaminated waste streams and in the Maximum Contamination Limit (40 CFR 141) regulations for contaminated groundwater. Information on *actual* cleanup levels at individual hazardous waste sites may be available at EPA Headquarters and Regional libraries and from State agencies.

Developers should note that in addition to meeting specific cleanup goals for the contaminated media in question, there also may be limits on permissible air emissions and/or wastewater discharges.

TECHNOLOGY APPLICATION

By the time a developer achieves full-scale commercialization, it is likely that regulatory requirements are reasonably well-understood; however, attention to this complex area can prevent unpleasant surprises.

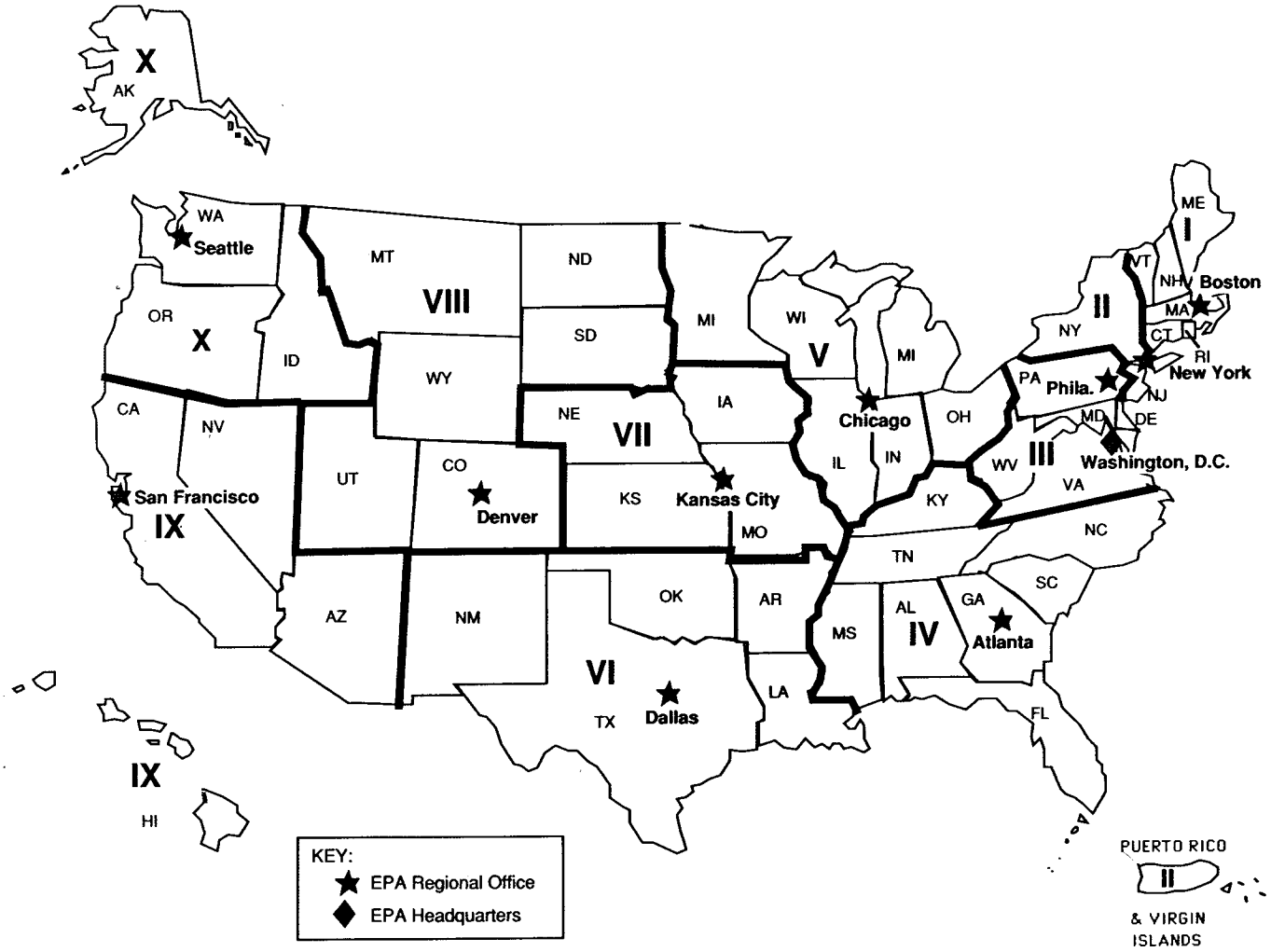
There are provisions for relief from *administrative* requirements (i.e., permits) for activities at some sites being cleaned up under the "Superfund" statute (CERCLA/SARA); however, substantive cleanup standards must still be met. Depending on the nature of the activity and its location, technology applications at other sites may be subject to permit requirements under the Federal RCRA, Clean Air Act, Clean Water Act, or underground injection control provisions of the Safe Drinking Water Act. States generally have equivalent provisions that also must be satisfied.

For General Regulatory Information Call the RCRA/CERCLA Industry Assistance Hotline 1-800-424-9346

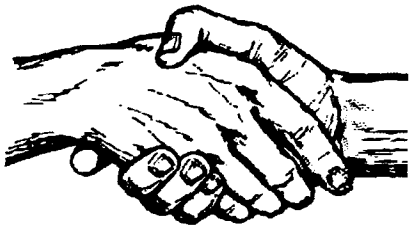
Developers of technologies for treating polychlorinated biphenyls (PCBs) should be aware that these technologies are subject to separate regulation by EPA's Office of Toxic Substances (40 CFR 761).

Toxic Substances Control Act Assistance Information Service 202-554-1404

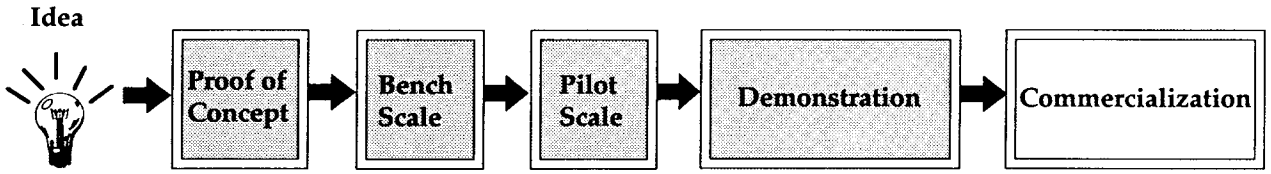
FIGURE 1
EPA REGIONS



III. ASSISTANCE PROGRAMS



- **Federal, State, and private programs exist to assist developers of innovative hazardous waste treatment technologies.**
- **Programs may provide financial and/or technical assistance, occasionally at no cost, to developers.**
- **The assistance programs identified in this section are particularly helpful in the development and demonstration stages of innovative hazardous waste treatment technology development.**
- **Assistance programs may provide developers with a mechanism for independently validating their results and communicating their successes.**
- **Conditions for assistance vary widely among programs.**



A number of Federal and State programs have been established to provide financial and/or technical assistance to technology developers. These programs range from those where grants are awarded for technology development to those where developers are given the opportunity to demonstrate the performance of their technologies at actual hazardous waste sites. This section highlights Federal and State assistance programs that may aid individuals in the development and demonstration stages of innovative hazardous waste treatment technology development. Interested developers should contact the appropriate programs for additional information.

FEDERAL ASSISTANCE PROGRAMS

Name: **Superfund Innovative Technology Evaluation (SITE) Program**

Address: U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
Office of Research and Development
26 W. Martin Luther King Drive
Cincinnati, OH 45268
Contact: Stephen James
Phone: (513) 569-7696

The SITE Program was established in 1986 by EPA's Office of Research and Development and the Office of Solid Waste and Emergency Response. Its purpose is to promote the development and use of innovative technologies to clean up Superfund sites across the country. The SITE Program has three major components:

- The Demonstration Program - Generates engineering and cost data on selected pilot and full-scale innovative technology demonstrations. EPA publishes an annual solicitation for proposals from developers to demonstrate their technologies, ideally at actual Superfund sites. Under this program, the vendor typically pays for the operation of the demonstration. EPA pays for the sampling and analysis and generates a report to communicate the results of the demonstration.

- The Emerging Technologies Program - Supports bench-scale and pilot testing of innovative treatment technologies. EPA publishes an annual solicitation for participants who may receive up to $150,000 per year for two years.

- The Monitoring and Measurement Technologies Program - Supports the development and demonstration of innovative field-ready technologies that detect, monitor, or measure hazardous substances in the air, surface water, soil, subsurface, wastes, and biological tissues. (For more information contact Eric Koglin (702)798-2432.)

Name: **Small Business Innovative Research Program**

	Environmental Protection Agency	Department of Energy	Department of Defense
Address:	401 M St., SW Washington, D.C. 20460	19901 Germantown Road Germantown, MD 20874	Office of the Secretary of Defense Small Business Affairs Washington, D.C. 20301
Contact:	Donald Carey	Gerry Washington	Robert Wrenn
Phone:	(202) 382-7445	(301) 353-5867	(703) 697-9383

The Small Business Innovative Research (SBIR) Program is a multi-media assistance program. The program focuses primarily on U.S.-owned, high-technology companies with 500 or fewer employees. SBIR activities are overseen by the Small Business Administration. Funding is provided to companies through grants or contracts awarded individually by SBIR program offices in 11 Federal agencies. Each agency offers at least one SBIR program solicitation per year specifying the types of research to be funded. Responses to agency solicitations are reviewed and award decisions made by the distributing agency.

SBIR is a three-phased contract and grant program. In Phase I, contracts and grants are awarded in average amounts of $50,000 each for technology feasibility studies of six months or less. In Phase II, SBIR awards contracts and grants for one to two years of principal research and/or development. Contract and grant amounts in Phase II range from a minimum of $150,000 to a maximum of $500,000 depending on the awarding agency. Only Phase I recipients are eligible for Phase II awards. Phase III funding assistance is provided in one of two ways: commercial application with funding or sales from the private sector; or non-SBIR funding by the agency for further R&D of interest to the agency. Interested developers of hazardous waste treatment and remediation technologies should contact the individuals listed above for agency-specific solicitation schedules.

FEDERAL ASSISTANCE PROGRAMS (Cont'd)

Name: **The Federal Technology Transfer Act**

Address: Environmental Protection Agency
OTTRS/ORD
26 W. Martin Luther King Drive
Cincinnati, OH 45268
Contact: Larry Fradkin
Phone: (513) 569-7960

In the past, legal and institutional barriers have prevented government and industry from collaborating in developing and marketing effective technologies to prevent and control pollution. The Federal Technology Transfer Act of 1986 (FTTA) removes some barriers to the joint development of commercial treatment technologies. The FTTA allows flexible cooperative research and development agreements (CRDAs) among Federal laboratories, industry, and academic institutions.

Under CRDAs, companies may be given exclusive rights to market and commercialize new technologies that result from the collaboration. For industry, the key advantage of CRDAs is the speed and ease with which the agreements can be negotiated and signed. CRDAs are not subject to Federal contracting or grant requirements.

Environmental research, such as development of innovative technologies for treating hazardous wastes, require the collaboration of experts in many different fields. EPA's 12 interdisciplinary research laboratories that employ over 600 scientists and engineers can provide the needed expertise. Many of these laboratories combine world-class expertise with state-of-the-art equipment and fully permitted testing facilities.

STATE ASSISTANCE PROGRAMS

Name: **Illinois Industry and Technology Assistance Program**

Address: Illinois Hazardous Waste Research
and Information Center
1 East Hazelwood Drive
Champaign, IL 61820
Contact: Daniel Kraybill
Phone: (217) 333-8947

The Illinois Industry and Technical Assistance (ITA) Program is administered through the Illinois Hazardous Waste Research and Information Center (HWRIC). HWRIC operates a T&E facility discussed in Section IV of this booklet. The ITA program acts as an intermediary among local Illinois businesses, technology developers, and regulatory agencies to promote the use of innovative technologies for addressing hazardous waste. The ITA program offers advice to technology developers and access to networks within the State's business community. Information is offered on the availability of innovative hazardous waste treatment technologies. Participation in this program may offer developers of innovative hazardous waste technologies the opportunity to apply their technology to actual hazardous waste sites in the State of Illinois.

Name: **California Remedial Technology Assessment Program**

Address: Alternative Technology Division
Toxic Substances Control Program
Department of Health Services
P.O. Box 942732
Sacramento, CA 94234-7320
Contact: John Wesnousky
Phone: (916) 322-2543

The Remedial Technology Assessment Program (RTAP) was established to identify innovative treatment technologies and to match these technologies with appropriate Superfund sites in California. RTAP's annual solicitation of interest lists candidate sites around the State and requests developers to submit information on their technology. The annual summary of responses to the solicitation of interest provides an alphabetical listing of technology developers and a technology summary.

RTAP assists in locating sources of funding for site-specific demonstration projects at State Superfund sites. Funding may be provided through State Superfund program monies, responsible parties, a competitive waste reduction grant program, or funds of other government agencies. The program may issue variances instead of permits to developers as a means of expediting the application of their technology to specific sites.

Name: **MERRA**

Address: 2200 Commonwealth Blvd.
Suite 230
Ann Arbor, MI 45105
Contact: Mark H. Clevey
Phone: (313) 930-0033

MERRA is a non-profit, public/private venture of government, industry, research institutions, and academia. Waste treatment technology developers can benefit from MERRA's Specialty Business Development Center (SBDC), an industry-sponsored effort to provide business development assistance to Michigan proprietary technology-based small firms. MERRA-SBDC provides a variety of services to technology developers, including: Federal procurement assistance (e.g., providing information on R&D funding or grant applications), commercialization assistance (e.g., developing business plans or raising investment capital), and technology transfer (through collaborations with Michigan University and Federal laboratories).